CITY OF stillwater
Water Utilities

ADDENDUM NO. 2
Equipment Building at the Stillwater Water Treatment Plant
Project # 13WG02
SUA Bid No. 25-12/13

To: **All Prospective Bidders**

From: **Anthony Daniel, Director of Water Utilities**

Issue Date: **May 31, 2013**

The Contract Documents for the above described project are hereby modified by this Addendum No. 2. Each Bidder must acknowledge receipt of the Addendum in the place provided in the Bid Form.

CLARIFICATION TO CONTRACT DOCUMENTS

The following clarifications and/or additional requirements are made to the Specifications and Contract Documents for the project.

1. *Technical Specifications-Section F* pages F-1 through F-3 as originally issued are hereby deleted and replaced with *Technical Specifications Section F-As Revised by Addendum No. 2 dated May 31, 2013* pages F-1 through F-4. (Attached hereto). This new revised document includes ~~strikethroughs~~ for deleted portions and underlined additions.

2. *Construction Standards Section 2200 Concrete* (as referenced in the revised Technical Specifications) Pages 1 through 16 are hereby included/ (attached hereto.

3. *List of Documents Required-Section H*, pages H-1 through H-2 as originally issued are hereby deleted and replaced with *List of Documents Required-As Revised by Addendum No. 2 dated May 31, 2013,* page H-1 through H-2. (Attached hereto).

4. *Bid Form-Section J*, page J-5 only is hereby deleted and replaced with the *Bid Form-As Revised by Addendum No. 2 dated May 31, 2013,* Page J-5 only. (Attached hereto).

5. *ATTACHMENT 1* is replaced by *ATTACHMENT 1-Revised Per Addendum No. 2 dated May 31, 2013* (attached hereto).

6. The *Report of Subsurface Exploration and Geotechnical Evaluation* is hereby included. (Attached hereto).

End of Addendum No. 2

Technical Specifications for the
Design, Supply and Construction of a Metal Equipment Storage Building
at the City of Stillwater Water Treatment Plant

1. Project Description

1.1. The successful bidder is required to undertake all necessary engineering design for the supply and construction of an industrial type equipment storage metal building at the designated site within the Stillwater Water Treatment complex.

1.2. The sketch plan of the proposed building is shown on the Attachment 1.

1.2.1. The minimum dimensions of the building are Forty (40) feet wide, Eighty (80) feet long and Eighteen (18) feet full wall height with a clear structural span each way and vertically to roof system.

1.2.2. The building will have four (4) bay roll-up doors.

1.2.3. The building will have two (2) ~~three (3)~~ side entry service doors and one interior passage door within the separation wall between the parts storage area and equipment bays.

1.3. The east bay of the building will be used primarily as a parts storage area for storing and servicing light equipment (primarily water pumps, motors, gasoline engine powered equipment, etc.)

1.4. The west bays will be used to store large pieces of equipment. The list of equipment (not all inclusive) that shall be stored in the west 3 bays are as follows:

Description of Large Equipment	Weight (LBS)
Track Loader	34,000
Tractor	10,373
Backhoe	16,000

2. *Project Scope*

2.1. Bidder shall be fully responsible for the turnkey project that requires the provision of all engineering services needed for the field investigation including field survey ~~and geotechnical investigation~~ needed for the proper design of the reinforced concrete slab and required foundation for the metal storage building. [geotechnical report provided by City of Stillwater, see addenda]

2.2. Bidder is responsible for designing, supplying and installation of all electrical power supply and cabling for the needed lighting (interior and exterior), operation of the motor operated roll-up doors, gas fired heaters, ventilation and exhaust fans with louvers and 110/220V outlet receptacles. All electrical design supply and installation shall comply with current electrical codes, to include NEC2011, and City of Stillwater Standards.

2.3. Bidder is responsible for designing and installation of steel piping ~~to supply natural gas from an adjacent facility to~~ for the proposed metal building. The City of Stillwater will provide gas piping to the building site. Natural gas radiant heater will be Dayton brand. The three equipment bays will use two(2) each model 7D841, 30' tube heaters, or approved equal. The parts storage

bay will have no heater. The contractor will provide a gas regulator as required. All plumbing and heating system, including the location of heaters, thermostats, required ventilation fans, cut off valves, etc., shall be designed to comply with current plumbing and HVAC codes, to include IMC 2009, as adopted by the City of Stillwater.

2.4. Bidders shall be responsible for submitting a design that meets all current city, county, state and federal standards for metal storage buildings within a potable water treatment facility. The bidder is responsible for complying with the prevailing standards, codes, and requirements, including IBC 2009. Bidder is strongly advised to consult with City of Stillwater Building Official, Mike Roberts at 405-742-8218, for further clarification as needed. The building will be used primarily for storage but can be used by Water Plant personnel to perform maintenance on all types of plant equipment.

2.5. Bidder shall provide the following design information with calculations as part of the submittal, review and approval process. Failure to provide the required information shall require resubmittal of the missing or incomplete items of the submittal. All submittals where an Oklahoma Registered Professional Engineer's stamp and signature on the drawing is required, shall be provided with the drawings as part of the submittal process. As a minimum, the following items shall be submitted:

2.5.1. Design of the concrete slab and the foundation to support the columns of the proposed metal building. Concrete will be per city Construction Standards Section 2200 Concrete, adopted 2/21/13. Building slab foundation will have a monolithic perimeter stem wall above slab elevation to keep the metal siding off of the grade and minimize steel deterioration. Engineer approved structural earth fill material will be used to backfill any earthwork on site to bring the facility to needed elevation. Recommendations from the geotechnical evaluation prepared by Building & Earth, dated May 30, 2013 will be used for the basis of design.

2.5.2. Design of the industrial type building using commercial grade ASTM A36 (channels, angles, plates, bars), ASTM A992 (W-shapes), ASTM A500 (structural tubing), and ASTM A53(tubing), red iron structural frame and roof system. The wall sheeting will be 24-gauge aluminum-zinc alloy coated steel sheet siding (ASTM A792/A792M), Class AZ50 coating, grade 40, structural quality, or approved equal, with two-coat fluoropolymer finish in addition to the manufacturer's prime/adhesive. The design should take into consideration the wind and snow loadings. Roof pitch will be a minimum of 1:12 and a maximum of 3:12. The roof decking will be VULCRAFT™ Type B, 24-gauge or better, mechanically seamed wide rib decking, or approved equal. The method of fastening the roof panels using screws/washers and caps should be clearly shown on the submittal. The components shall be fabricated and supplied by one manufacturer and shall be assembled by an approved assembler/construction company. Commercial grade 26-guage guttering and downspouts will be provided to match roof profile. Following building erection, and prior to covering of walls or roof with insulation, the Contractor will provide for an inspection by the building manufacturer to certify construction craftsmanship for warranty.

2.5.3. Design of the heating system utilizing ceiling mounted natural gas fueled heaters with separate thermostats and controls shall be provided to regulate the temperature in the equipment storage area and the parts storage area. The intent is to keep the temperature in the equipment area near 50 degrees F and be set not to exceed 55 degrees F. The temperature in the large bay area should stay well above freezing during freezing conditions in the winter.

2.5.4. Design of the electrical system that is required to provide adequate lighting and convenience outlets for maintenance personnel to work on the equipment. 220v Single-phase power will be provided to the building site by the City.

2.5.4.1. 120v Receptacles with proper grounding shall be provided to power hand tools, etc. At selected locations, 220V outlets shall be provided to test electric motors, etc. All electric cables will be installed using conduits. Provide and install three LUMAPRO 3-outlet, 12/3 conductor, 40-foot retractable cord reels, or approved equals.

2.5.4.2. All interior lights shall be turned on/off using 3-way switches located at each of the two exterior service doors and both the bay side and storage area side of the parts storage area door. The intent is that personnel can turn on/off the lights from any door opening as they enter/exit. Interior lights will be Lithonia SPEC-BEAM™ FGB26 T5H0 Flourescent High Bay (T5's at 24" x 48" with 6-bulbs), or approved equal. Provide and install three(3) LUMAPRO 5w LED, 40-foot cord hand lamp cord reel (Grainger #2YKP9) or approved equal.

2.5.4.3. Exterior area lighting will be provided above each bay door. Lights will be Hubbell Perimaliter®LED Wallpacks, model PGM3 LED, rated at 69 watts with glass refractors, or approved equal. Exterior bay door lights will be single pole switch controlled from inside of building adjacent to each door. Exterior lighting for two side entrance personnel doors will be Hubbell Laredo LED LNC wallpacks, model LNC-5LU-5K, 5 LEDS with glass refractor and photo cell operation, or approved equal.

2.5.5. The submittal for the metal building proposed shall as a minimum show three or more views of the building as installed with gutters and downspouts. If insulated windows are recommend to admit natural light without contributing heat loss, these can be incorporated into the plans.

2.5.6. All roll-up door corners shall be adequately protected using bollards. Bollards shall be 4 foot high Six inch diameter pipe and filled with concrete. Bollards shall be painted with 2 coats of high quality 'safety yellow' paint. Sixteen total bollards are required.

2.5.7. A total of Three (3) -Three (3) feet wide x Seven (7) feet high service type access doors with stainless steel hinges and locksets shall be installed as shown. Doors will be FIB-R-DOR ™ Lightweight Fiberglass Reinforced Door and Frame Systems, or approved equal. These doors shall be commercial grade insulated and suitable for outdoor installation and fitted with spring mechanical door closures to protect the door from wind gusts. Doors shall have a panic bar per OSHA/PEOSH requirements.

2.5.8. A total of Four (4) electric motor operated roll up doors shall be installed as shown. Door dimensions are as follows: 14 feet wide x 16 feet high. Doors will be Overhead Door™

Company model Stormtite 625 heavy-duty with brush seals, RHX 220v-single phase bench operator, and electric safety edge bottom. ~~The doors shall be locked on the inside, operated from inside only and incorporate all the required safety features. All doors shall be keyed to match the Water Treatment Plant keys.~~ In case of power failure, roll-up doors shall have a manual override (hand crank).

2.5.9. A non-insulated ~~An insulated~~ full height, floor to ceiling (deck/roof), interior wall shall be constructed to separate the parts storage area from the equipment storage area. The wall will be built with 20 gauge or better cold rolled steel framing and sheathed on both sides with 24-gauge or better steel siding. The interior wall ~~and ceiling~~ of the parts storage area shall be ~~insulated and~~ lined with ½" A/B grade plywood, eight (8) feet high.

2.5.10. All exterior walls to the facility ~~The interior wall and ceiling of the equipment bay areas and the clean room~~ shall be insulated using closed cell rigid polyurethane spray foam insulation applied to the inside of the walls.~~to provide a minimum insulation factor of R-10~~. Foam will be Gaco Western WallFoam™ System 183 or approved equal applied at two (2) inches thick. Ceiling will be insulated using 3" rigid R-10 reinforced backing insulation. ~~The wall separating the clean room from the equipment bays shall also be insulated.~~

2.5.11. As shown in Attachment 1, the bidder shall construct a twenty (20) ~~twelve (12)~~ feet wide reinforced concrete approach slab for the full length of the south side of the building and further narrows to 4 feet wide at the two entrance doors (east and west doors). The slab shall be designed and constructed to support the load imposed by heavy equipment being moved in/out of the building. Bidders shall ensure as part of the site preparation and grading, all roof run-off, snow melt and storm water runoff will be directed away from the new building.

2.5.12. Bidders shall ensure that the metal building is adequately sealed to minimize heat loss by providing weather proofing at the base, eaves, rakes and at all openings and penetrations. Building will be completely architecturally trimmed at all openings and feature transitions.

2.5.13. As part of the submittal approval process the contractor (and their subcontractors) shall be required to obtain all required permits from the City of Stillwater-Development Services Building Safety Division. All permit fees will be waived. All license and registration fees are to be paid by the Contractor.

2.5.14. Owner will hire a testing company to perform compaction testing on the subgrade and collect/test concrete cylinders to ensure specifications are met.

2.5.15. Facility will be designed with three (3) wall mounted propeller type exhaust fans for the equipment bays. Fans will be Loren Cook Company model XPHD, or approved equal, with manufacturer provided/assembled wall collars, exterior galvanized steel weather hood and bird screen, motorized damper, and interior OSHA wire blade guard cover.

2.5.16. Provide survey for site design to ensure maximum equipment approach slope of 1:12 with final site perimeter grading and restoration to provide water run off away from the building slab with a maximum slope of 4:12 and a minimum slope of 1:12.

End of Section

Part 1: General

A. Scope
   1. This section shall govern the performance of all work necessary for construction of cast-in-place concrete structures for inlets, manholes, junction boxes, head walls, and incidental structures. Construction of concrete street pavements shall conform to Oklahoma Department of Transportation 2009 Standard Specifications and Associated American Concrete Institute Standards.
      a) 2. The Contractor shall guarantee that concrete of the specified compressive strength is incorporated in the structures and that the responsibility for producing the required grades of concrete is assumed by the Contractor. Should the average strengths shown by test cylinders fall below the strengths required, the City of Stillwater may require any or all of the following changes: amount of cement; grading of aggregate, or ratio of the water to the cement used. If the tests disclose that the strength of the concrete is insufficient for the structure as built, the City of Stillwater may condemn the part of any structure in which concrete of insufficient strength has been placed and the Contractor shall replace all in-place concrete whose representative cylinder fails a strength test.
      b) Concrete shall conform to the applicable requirements of 2009 ODOT Standard Specifications -Section 700 Materials, or most current edition and appropriate ACI Standard Specifications, most current edition.

B. Quality Assurance:
   1. Submittals:
      a) The Contractor shall furnish, to the City of Stillwater, the certificates and test results described below. The City of Stillwater may require additional tests and/or verifications to insure the quality of concrete produced is as specified.
      b) Concrete:
         1) Mix design: Provide mix design formula for the materials proposed for use in making concrete using the absolute volume method. The design shall include material sources, specific gravities and other pertinent data.
         2) Strength: Prior to placing any concrete, the compressive strength shall be verified by making three test cylinders using the proposed mix designs. The cylinders shall be tested and the results provided with the mix design submittal.
      c) Reinforcing steel:
         1) Comply with requirements of the latest edition of the following codes and standards, except as herein modified:
            A. American Welding Society, AWS D1.4-1979, "Standard Welding Code - Reinforcing Steel."
            B. Concrete Reinforcing Steel Institute, "Recommended Practice for Placing Reinforcing Bars."
            C. Concrete Reinforcing Steel Institute, "Manual of Standard Practice for Reinforced Concrete Construction."
            D. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete."
            E. ASTM A615: "Specifications for Deformed and Plain Billet-Steel Bars for concrete Reinforcement."
            F. ACI 315: "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
            G. ASTM A185: "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement".
      d) Formwork: Unless otherwise shown or specified, design, construct, erect, maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the following:
         1) ACI 347: Recommended Practice for Concrete Form work.

2) USPS PSI: Product Standard for Softwood Plywood Construction and Industrial.

e) Allowable tolerances:
   1) Construct form work to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 374.
   2) Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
   3) During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

Part 2: Materials

A. Cement
   1. All cement used in the work shall be a standard brand of portland cement and shall comply with the cement ASTM C150 Standard Specifications for "Air-Entraining Portland Cement". The cement shall be Type I.
   2. All cement hauled to the job shall be in original unopened containers, bags or sacks showing the brand name of the manufacturer. Only one brand of cement shall be used in any individual structure. Cement reclaimed by cleaning bags or cement that has leaked from containers shall not be used. Cement shall be used in the sequence of shipments received, unless otherwise directed.
   3. Different brands, grades or types of cement shall be stored separately. All cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment, in a suitable weather tight building that will protect it from dampness and deterioration. Packages of cement which have become partially set, or contain any lumps or caked cement shall be rejected; and, in no instance will any portion of a bag of damaged or faulty cement be used.

B. Aggregates
   1. All aggregates used shall conform to the requirements of ASTM C33 Specifications for "Concrete Aggregate", unless otherwise indicated on the drawings or directed by the City of Stillwater.
   2. Sampling and testing: Sampling and testing shall be in accordance with the latest revision of the AASHTO Methods.

Sampling	T-2
Sieve Analysis	T-27
Material Passing No. 200	T-11
Organic Impurities	T-21
Clay Lumps and Friable Particles	T-112 modified
Coal and Lignite	T-113
Mortar and Tensile Strength	T-35

   3. Storage: Aggregate shall be stored in a manner that will allow good drainage and will insure that the aggregate is kept free of foreign matter. Sites for stock piles shall be graded and cleaned prior to storing materials. Aggregate from different sources shall be stored in separate stock piles. Care shall be taken to prevent segregation; material which becomes segregated to the extent that it no longer satisfies the grading requirements shall be combined to satisfy such requirements before being used in concrete.

C. Water
   1. Water used in mixing concrete shall be clean, clear, and free from deleterious amounts of acids, alkalis, oil, salt, organic materials or any other substances injurious to the finished concrete. Water from City water system may be accepted without being tested. Water from other sourses shall not be used until tested and approved. Testing of water shall be in accordance with AASHTO Method T-26.

D. Admixtures
   1. Air-entraining admixtures shall conform to ASTM Specifications C-260.
   2. Set-control admixture: Set controlling agents shall conform to ASTM C 494, as follows:

a) Type A, Water Reducing
b) Type B, Retarding.
c) Type C, Accelerating.
d) Type D, Water-Reducing and Retarding.
e) Type E, Water-Reducing and Accelerating.

3. Other admixtures: Other admixtures, unless specifically called for, shall be used only with the written approval of the City of Stillwater and shall be used in accordance with the manufacturer's instructions and recommendations.

E. Fly Ash: Use of fly ash or other cement subsitutes shall conform to ODOT Standard Specification Section 702 Supplementary Cementitious Materials.

F. Reinforcing Steel

1. Reinforcing bars (rebar): All reinforcing bars shall be rolled from new billets and shall conform to the ASTM A615 Specifications for Billet-Steel Bars for Concrete Reinforcement, and shall be of the Grade 60 unless otherwise specified. Unless otherwise shown, all reinforcing bars shall be deformed and shall conform to the requirements of the ASTM A615 specifications for minimum reinforcement. The deformed bars used shall have a net sectional area at all points equivalent to that of plain bars of equal nominal size. Twisted steel bars shall not be used.
2. Supports for reinforcement: Reinforcement supports shall be bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcements in place.
   a) Wire bar type supports shall comply with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, or concrete block.
   b) Sand plates or horizontal runners shall be used where base material will not support chair legs for slabs on grade.
   c) Either hot-dip galvanized, plastic protected or stainless steel protected legs shall be used for exposed-to-view concrete surfaces, where legs of supports are in contact with forms.
   d) Tie wire: Tire wire sixteen (16) gauge minimum and in sufficient quantity to hold reinforcement accurately in place during concrete placement operations.
   e) Welded steel wire fabric: Fabric shall conform to the requirements of ASTM A185 and shall be of the size and space opening as designated on the plans.
3. 3. Fabrication:
   a) General: Reinforcing bars shall be fabricated conforming to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice." In case of fabricating errors, the Contractor shall not rebend or straighten reinforcement in a manner that will injure or weaken the material.
   b) Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work:
      1) Bar lengths, depths and bends exceeding specified fabrication tolerances.
      2) Bend or kinds not indicated on drawings or final shop drawings.
      3) Bars with reduced cross-section due to excessive rusting or other cause.
   c) Identification: Reinforcing bars shall be tied in bundles and tag with weatherproof tags showing shop drawing numbers.
4. Splicing: Provide a minimum of 35 bar diameters of lap length.

G. Forms

1. 1. Forms for exposed concrete: Form work for exposed concrete surfaces shall be high-density overlay plyform Class I or II. Panels shall be APA grade-trade-marked and meet requirements of the latest edition of U.S. Product Standard PSI. Overlay shall not stain the surface of the architectural concrete. Full sheet sizes shall be used to minimize number of joints and to conform to joint system shown on drawings. Form material shall be of sufficient thickness to withstand pressure of newly placed concrete without bow or deflection (minimum 3/4 inch).
2. 2. Forms for unexposed concrete: Concrete surfaces, which will be unexposed in the finished structure, shall be formed with plywood, lumber, metal, or other acceptable material. Lumber shall be dressed on at least 2 edges and 1 side for tight fit, tongue and grooved, free from loose knots and of such moisture content as to prevent free absorption of moisture.

3. 3. Form coatings : Commercial formulation form coating compounds shall be provided will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. Release agent shall be used in strict accordance with manufacturer's recommendations.
4. 4. Vinyl foam tape: Vinyl foam tape shall be 3/4" x 1/8" adhesive backed closed cell tape.
5. 5. Form accessories: Only form ties, anchors, and hangers of sufficient strength to completely resist displacement of forms due to construction loads and the depositing of concrete shall be used. Tie-and-spreader type form ties designed so that no metal will be within one inch of any surface when forms are removed shall be used. Where concrete surfaces are exposed to view, the Contractor shall not use form ties which, when removed, will leave a depression larger than one (1) inch in diameter. The Contractor shall use water seal ties in concrete exposed to hydrostatic pressure which conform to ACI 301 and 347.
   a) a. Metal inserts shall be used for anchorages of materials or equipment to concrete construction, not supplied by other trades and as required for the work. Threaded inserts of malleable cast iron, furnished complete with full-depth bolts to the proper size shall be used unless otherwise noted.
   b) b. Adjustable wedge inserts of malleable cast iron, complete with bolts, nuts and washers, and bolt size, shall be used.
6. c. Screen chairs: Metal or wood screen chairs shall not be used.
7. d. Corner chamfer: Chamfers shall be mill run white pine solid material or preformed PVC at all exposed corners of columns, walls and beams.

H. Concrete Curing Compounds
1. 1. Absorptive cover: Burlap cloth shall be made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 3.
2. 2. Moisture-retaining cover: Moisture retaining covers shall be one of the following, complying with ASTM C 171.
   a) a. Waterproof paper.
   b) b. Polyethylene film.
   c) c.. Polyethylene-coated burlap.
3. 3. Membrane-forming curing compound: Membrane forming curing compounds shall conform to ASTM C 309, Type I with white fugitive dye unless other type acceptable to the City of Stillwater.
4. 4. Liquid curing, sealing, hardening compound: The following list of materials is not intended to be a complete list of materials and work required but a guide to the type, quality, and finish required for various surfaces. The list of products below is intended only to set a standard of quality.

Product	**Manufacturer**
Eucocure	Euclid Chemical Co.
Masterseal	Master Builders
Polyclear	Upco Chemical/USM Corp.
Dress & Seal	L & M Construction Chemicals
Triple Seal	Protex Industries
Clear Bond	Guardian Chemical Co.
Cure & Seal	Symons Corporation
Kure-N-Seal	Sonneborn Building Products

Special notes:
- Curing compounds containing oil or wax shall not be used.

- Allow concrete to thoroughly dry following rain.
- Use form release agents which will not transfer to the concrete.

I. Water Stops: Provide 3-1/4" polyvinyl chloride (PVC) water stops at construction joints and other joints of type shown on drawings.
J. Preformed Expansion Joint Fillers: Preformed expansion joint fillers shall conform ASTM D-1751, and be non-extruding and resilient type.
K. Radius Former: Radius former shall be PVC.
L. Flowable Fill:
   1. Specify strength limitations to allow for diggable flowable concrete.
   2. Flowable Fill admixture shall be provided with manufacturers instructions regarding installation requirements and strength limitations.

Part 3: Installation

A. Concrete mixing:
   1. Experimental concrete mixes:
      a) The Contractor shall make experimental mixes prior to the placing of the concrete and at any time during the progress of the work when necessary to demonstrate that the concrete will meet these specifications. Materials for making experimental mixes shall be furnished by the Contractor and these materials shall be identical with those intended for use in the work. The cost of the materials, as well as the costs of crushing test specimens made from the experimental mix, shall be borne by the Contractor and shall be included in the price bid for concrete.
   2. On-site mixing:
      a) General: The Contractor shall mix concrete in a batch mixer conforming to requirements of the mixer manufacturer's Bureau of the Associated General Contractors of America. Mixer shall bear the manufacturer's rating plate indicating rated capacity and recommended revolutions per minute; operate mixer in accordance with these recommendations; and use only mixers that are equipped with a suitable charging hopper, water storage tank, water measuring device and are capable of thoroughly mixing the concrete into a uniform mass within the specified mixing time and of discharging the mix without segregation.
      b) Admixtures: After approved for use, the Contractor shall dispense liquid admixtures by means of an automatic dispenser or similar metering device; weigh or measure by volume powdered admixtures, as recommended by the manufacturer; accurately measure all admixtures to within plus or minus 5 percent; and shall provide suitable agitating equipment to insure uniform distribution of ingredients.
      c) Mixing: The Contractor shall charge batch into the mixer so that some water will enter in advance of the cement and aggregates; allow water to flow into the mixer until the end of the first 25 percent of the specified mixing time; provide controls to insure that the batch cannot be discharged until the specified mixing time has elapsed; provide controls to insure that no additional water may be added during mixing; and discharge the entire batch before recharging.
      d) Mixing time: The Contractor shall mix each batch of 2 cubic yards or less for not less than 1-1/2 minutes, and not more than 5 minutes after all ingredients are in the mixer before any part of the batch is released; increase mixing time by 15 seconds for each additional cubic yard or fraction thereof; and not exceed 30 minutes total elapsed time between intermingling of damp aggregates and cement to the discharge of the completed mix into the forms.
      e) Maintenance: The Contractor shall keep mixer clean and replace mixer pick-up and throw over blades when they have lost 10 percent of their original depth.
      f) Identification: The Contractor shall provide a batch ticket for each batch discharged and used in the work, indicating the project identification name and number, date, mix type, mix time, quantity and amount of water introduced.

g) Retempering: The Contractor shall mix concrete only in quantities for immediate use. Discard concrete which has set; do not retemper. Adding water to the mix at the job site shall not be permitted.

3. Ready-mix concrete: The Contractor shall comply with the requirements of ASTM C94, and as herein specified, provided quantity and rate of delivery will permit unrestricted progress of the work in accordance with the placement schedule. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. Proposed changes in mixing procedures shall be accepted by the City of Stillwater before implementation. All mixer trucks shall be equipped with water meters. Plant equipment and facilities should conform to National Ready-Mix Concrete Association "Check-list for Certification of Ready-Mixed Concrete Production Facilities".
   a) Consistency:
      1) All reinforced concrete which is required to be spaded or puddled in forms or around reinforcing steel shall be of such consistency that:
         A. All aggregates will float uniformly throughout the mass without settling or segregating.
         B. When dropped directly from the discharge chute of the mixer, the concrete will flatten out at the center of the pile but will stand up at the edges, the piling spreading from internal expansion and not by flowing.
         C. The concrete will flow sluggishly when tamped or spaded.
         D. The concrete can be readily puddled into corners and angles of forms and around reinforcing steel,
         E. The concrete can be readily spaded to the bottom of the placement or to a depth of several feet at any time within thirty (30) minutes after placing.
      2) A desirable consistency is one which results in a very slight accumulation of water at the top of a layer several feet in thickness, but without segregation or accumulation of laitance. If, through accident, intention or error in mixing, any concrete shall vary materially from the consistency specified, such concrete shall not be incorporated in the work but shall be discharged as waste material.

B. Cast-in-place concrete:
   1. Form work design:
      a) The Contractor shall design, erect, support, brace and maintain form work so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. The Contractor shall carry vertical and lateral loads to ground by a form work system and in-place construction that has attained adequate strength for that purpose. The Contractor shall construct form work so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
      b) The Contractor shall design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on Form work, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
      c) The Contractor shall provide shores and struts with positive means of adjustment capable of taking up form work settlement during concrete placing operations, using wedges or jacks or a combination thereof and provide trussed supports when adequate foundations for shores and struts cannot be secured.
      d) The Contractor shall support form facing materials by structural members spaced sufficiently close to prevent deflection; fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances; and provide camber in form work as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads for long-span members without intermediate supports.
      e) The Contractor shall provide temporary openings in wall forms, column forms and at other locations necessary to permit inspection and clean-out.
      f) The Contractor shall design form work to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

g) The Contractor shall provide form work sufficiently tight to prevent leakage of cement paste during concrete placement; solidly butt joints and provide backup material at joints as required to prevent leakage and fins; seal form joints with foam tape or other demonstrated effective means; and provide a means to seal the bottom of forms at construction joints such as foam tape or other gasket devices.

2. Placing forms:
   a) Concrete forming shall conform to ACI Code 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structures; provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking screeds, bulkheads, anchorages and inserts, and other features required; and use select materials to obtain required finishes.
   b) Forms shall be installed so removal without hammering or prying against concrete surfaces. Crush plates or wrecking plates shall be installed where stripping may damage cast concrete surfaces. Top forms for inclined surfaces shall be installed where the slope is too steep or place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and assure ease of removal.
   c) The Contractor shall provide temporary openings where interior area of form work is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete. The Contractor shall brace temporary closures and set tightly to forms to prevent loss of concrete mortar and locate temporary openings on forms in as inconspicuous location as possible, consistent with project requirements.
   d) The Contractor shall form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.
   e) The Contractor shall provide openings in forms to accommodate other work, including mechanical and electrical work; and accurately place and securely support items required to be built into the form.
   f) The material to be used in the forms for exposed surfaces shall be sized and dressed lumber or metal in which all bolt and rivet heads are countersunk. In either case, a plain, smooth surface of the desired contour shall be obtained.
   g) Undressed lumber may be used for backing or other unexposed surfaces, except inside faces of conduits.
   h) Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed.
   i) Temporary openings where interior area of form work is inaccessible shall be used for clean out, for inspection before concrete placement, and for placement of concrete. Temporary closures shall be braced and set tightly to forms to prevent loss of concrete mortar. Temporary openings shall be located on forms in as inconspicuous location as possible, consistent with project requirements.
   j) Intersecting planes shall be formed to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.
   k) Provide openings in forms to accommodate other work, including mechanical and electrical work. Accurately place and securely support items required to be built into the form.
3. Falsework:
   a) The Contractor shall erect falsework and support, brace, and maintain it to safely support vertical, lateral and asymmetrical loads applied until such loads can be supported by in-place concrete structures; and construct falsework so that adjustments can be made for take-up and settlement.
   b) The Contractor shall provide wedges, jacks, or camber strips to facilitate vertical adjustments; carefully inspect falsework and form work during and after concrete placement operations to determine abnormal deflection or signs of failure; and make necessary adjustments to produce work of required dimensions.
4. Forms for exposed concrete:

A. *The Contractor shall drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes and not splinter forms by driving ties through improperly prepared holes.*
b) The Contractor shall not use metal cover plates for patching holes or defects in forms.
c) The Contractor shall provide sharp, clean corners at intersecting planes, without visible edges or offsets; and back joints with extra studs or girts to maintain true, square intersections.
d) The Contractor shall use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. The Contractor shall not use narrow strips of form material which will produce a bow.
e) The Contractor shall assemble forms to be readily removed without damage to exposed concrete surfaces.
f) The Contractor shall form molding shapes, recesses and projections with smooth-finish materials, and install forms with sealed joints to prevent displacement.

5. Corner treatment:
   a) The Contractor shall form exposed corners to produce square, smooth, solid, unbroken lines, except as other wise shown.
   b) The Contractor shall form chamfers with 3/4" x 3/4" strips, unless otherwise shown, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. The Contractor shall extend terminal edges to required limit and miter chamfer strips at changes in direction.
   c) Unexposed corners may be formed either square or chamfered.
6. Control joints:
   a) Concrete shall be placed continuously so that the unit will be monolithic in construction. Fresh concrete may be placed against adjoining units provided the set concrete is sufficiently hard not to be injured thereby. Joints not indicated shall be made and located to least impair strength and appearance of the structure. Concrete for walls shall be in place at least 2 hours before concreting beams, girders, or slabs thereon. Beams, brackets, and haunches shall be considered as part of the floor system and shall be placed monolithically therewith. Placement of concrete shall be at such rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is placed thereon. Girders, beams, and slabs shall be placed in one operation. In walls having door and window openings, individual lifts shall terminate at top and bottom of opening. Other lifts shall terminate at such levels as are indicated or as to conform to structural requirements or architectural details, or both, as directed.
7. Water stops: The Contractor shall provide water stops in construction joints as shown on the drawings. Install water stops to form a continuous diaphragm in each joint; make provisions to support and protect water stops during the progress of the work; fabricate field joints in water stops in accordance with manufacturer's print instructions; and protect water stop material from damage where it protrudes from any point. No wood device of any kind used to separate forms shall be permitted to remain in the finished work.
8. Provision for other trades: The Contractor shall provide openings in concrete form work to accommodate work of other trades, including those under separate prime contracts (if any). Size and location of openings, recesses and chases are the responsibility of the trade requiring such items. The Contractor shall accurately place and securely support items to be built into forms.
9. Cleaning and tightening: The Contractor shall thoroughly clean forms and adjacent surfaces to receive concrete; remove chips, wood, sawdust, dirt or other debris just before concrete is to be placed; and retighten forms immediately after concrete placement as required to eliminate mortar leaks.
10. Form coatings:
    a) The Contractor shall coat form contact surfaces with form-coating compound before reinforcement is placed; keep excess form coating from accumulating in forms or to come into contact with surface which will be bonded to fresh concrete; and apply in compliance with manufacturer's instructions.

b) The Contractor shall coat steel forms with a non-staining, rust-preventive form oil or otherwise protect against rusting. Rust-stained steel form work is not acceptable.

11. Installation of embedded items:
    a) General: The Contractor shall set and build into the wood anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete and use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
    b) Edge forms and screen strips for slabs: The Contractor shall set edge forms or bulkheads and intermediate screen strips for slabs to obtain required elevations and contours in the finished slab surface and provide and secure units to support types of screen required.
12. Shores and supports:
    a) The Contractor shall comply with ACI 347 for shoring and reshoring, and as herein specified.
    b) Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete.
    c) Locate and provide adequate reshoring to safely support the work without excessive stress or deflection.
13. Placing reinforcement:
    a) All reinforcement, when placed, shall be free from mill scale, loose or thick rust, dirt, paint, oil or grease, and shall present a clean surface. Storage of material shall be on pallets with tarpaulin coverings to prevent rust and scale.
    b) Bends and splices shall be accurately and neatly performed, and shall conform to the ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures and the CRSI Handbook.
    c) All reinforcing shall be placed in the exact position shown on the plans and shall be held firmly in position by means of metal chairs, bolsters, spacers, hangers or other accepted supports, such as wiring the bars together at intersections with accepted wire ties in order that the reinforcement will not be displaced during the depositing and compacting of the concrete. Tie wires ends shall be turned away from the exposed surfaces.
    d) When the concrete surface will be exposed to the weather in the finished structure or where rust would impair the appearance, the portions of all accessories in contact with the form work shall be galvanized steel or plastic.
    e) The placing and fastening of reinforcement in each section of the work shall be accepted by the City of Stillwater before any concrete is deposited in the section.
    f) Care shall be taken not to disturb the reinforcement after the concrete has taken its initial set.
    g) Reinforcing steel shall be overlapped to fully develop the reinforcing.
    h) Splicing bars shall be performed in accordance with ACI Code 318 for minimum lap. Splice locations shall be at mid-span on all top bars and at the supports for all bottom bars.
    i) The minimum coverages for reinforcement shall be maintained as stated in ACI Code 318.
14. Anchors and inserts:
    a) Anchor bolts, castings, steel shapes, conduit, sleeves, masonry anchorage, and other materials that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.
    b) Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut to be installed on the concrete side of the form or template. A second nut shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position.
    c) Inserts shall be clean when installed. After installation, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.
    d) The Contractor shall coordinate the installation of all anchors and inserts during forming operations. Prior to actual placement of concrete, all insert and anchor locations shall be rechecked to assure proper vertical and horizontal alignment.
    e) Care shall be taken during placement operations so as not to alter the location of any anchors or inserts.

f) After screening operations are complete, the vertical and horizontal alignment shall be rechecked to assure the proper location of anchors and inserts.
g) In the event the alignment is improper, the Contractor shall revise, repair, modify, or replace any anchor or insert which is improperly embedded. The cost of such work shall be borne by the Contractor.

15. Pre-placement inspection:
    a) Before placing concrete, inspect and complete the form work installation, reinforcing steel, preformed joint fillers, vapor barriers, water stops and items to be embedded or cast-in. Notify other crafts involved in ample time to permit the installation of their work; cooperate with other trades in setting such work, as required.
    b) Thoroughly wet the forms immediately before placing concrete, as required where form coatings are not used. Where coating is used, the Contractor shall with a brush or spray coating, covering the form evenly without excess drip. Form oil which causes softening or permanent staining of the concrete shall not be used.
    c) Soil at bottom of foundation systems is subject to testing for soil bearing value by the testing laboratory. Place concrete immediately after approval of foundation excavations. Excavate and backfill as necessary to complete the concrete work. Place concrete on subgrades that are well compacted to level and true grade. Before concrete is placed in areas between slabs on grade previously placed, recheck compaction of subgrade and if necessary, re-compact to avoid settlement of slabs at joints. Seal extremely porous subgrades in a manner approved by the City of Stillwater. Remove all ice, debris, and excess water from subgrades.
    d) Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
    e) The installation of anchors, inserts, and sleeves for electrical, mechanical plumbing, heating, ventilating and air-conditioning work is subject to the inspection and approval of the supervisors of the particular trades involved. Finish voids in sleeves and inserts temporarily with readily removable material.
    f) Notify the City of Stillwater 24 hours before placing concrete.
16. Concrete conveying:
    a) General: Handle concrete from the mixer to the place of final deposit as rapidly as practicable and in a manner which will assure that the specified quality of the concrete is obtained.
    b) Equipment: Provide conveying equipment of proper size and design to insure a continuous flow of concrete to a delivery end. Conveying equipment will be subject to the City of Stillwater's approval.
    c) Truck mixers, agitators and non-agitating units and their manner of operation shall conform to the applicable requirements of ASTM C 94.
    d) Belt conveyors: Provide conveyors and discharge apparatus of a type which will not cause segregation. Discharge long runs into a hopper.
    e) Chutes: Provide metal or metal lined chutes and install to a slope not exceeding 1 vertical to 3 horizontal and not less than 1 vertical to 20 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a proper hopper.
    f) Runways: Provide runways or other means for wheeled equipment to convey concrete to placement points. Do not support runways on reinforcement, or wheel equipment over reinforcement.
    g) Pumps: Do not pump concrete without the City of Stillwater's approval. Any change in concrete mix necessitated by pumping must be approved by the City of Stillwater prior to placing concrete by this method.
17. Placing concrete:
    a) Place concrete in compliance with the practices and recommendations of ACI 304, and as specified herein. Do not place any concrete until the City of Stillwater has reviewed the results of the design mix 28-day test breaks and approval is given to proceed.

b) Concrete shall be deposited so that the aggregates are not segregated. Conveying concrete shall occur to prevent segregation of the aggregate. Conveying shall be by belt conveyor, tremmie, chutes or pumps. Vertical drops in excess 5 feet shall be conveyed using one of these techniques. Chutes shall not be used if the slopes are greater than 3:1.
c) Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
d) Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.
e) The concrete shall be deposited in continuous horizontal layers so that no concrete will be allowed to harden and cause the formation of seams or planes of weaknesses. Concrete placement shall occur at a rate to keep the placed concrete integral with the new concrete. Work shall be arranged in order that each part of the work shall be placed as a unit if this is possible. Where necessary to stop placing concrete, the work shall be brought up in level courses and against a vertical stop board.
f) Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping, so that the concrete is thoroughly worked around reinforcement and embedded item and into the corners of forms. Consolidate each layer of concrete with previously placed layers in a manner that will eliminate all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Where internal vibrators are used, provide mechanical vibrators with a minimum frequency of 7000 revolutions per minute. Do not use vibrators to transport concrete. Insert and withdraw vibrators at points from 18 to 30 inches apart for 5 to 15 seconds duration. Keep a spare vibrator on the job site during all concrete operations.
g) Reinforcing steel position shall be held continuously during concrete placement.
h) The placing of concrete under water, where permitted, must be done by special accepted methods.
i) Formed elements: Use internal vibrators, not form vibrators. When a surface mortar is to be the basis of the finish, work coarse aggregate back from the forms with a suitable tool to bring a full surface of mortar against the form.
j) Supported elements: Use internal vibrators in elevated beams, girders and brackets and along construction joints. Consolidate elevated slabs with vibrating bridge screeds, roller pipe screens or other means approved by the City of Stillwater. Tamp slabs to force aggregates away from surface and screen level to comply with ACI 347. After screeding, do not manipulate concrete prior to commencing finishing operations.
k) Bring slab surfaces to the correct level with a straight edge and strike off. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

18. Cold weather placement:
    a) Concrete placed during cold weather shall conform to ACI Code 306-1-90 Standard Specification for Cold Weather Concreting.
19. Hot weather placement:
    a) Concrete placed during hot weather shall conform to ACI Standard 305.1-06. Specification for Hot Weather Concreting. The work shall be performed entirely at the Contractor's risk.
20. Bonding:
    a) Roughen surface of set concrete at all joints, except where bonding is obtained by use of a concrete bonding agent, and clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose boned aggregate uniformly and to not leave latence, loose particles of aggregate, or damaged concrete at the surface.
    b) Prepare for bonding of fresh concrete to new concrete that has set but is not fully cured, as follows:
        1) At joints between footings and walls and between walls and beams or slabs they support, and elsewhere unless otherwise specified herein, dampen but do not saturate, the

roughened and cleaned surface of set concrete immediately before placing fresh concrete.

2) At joints in exposed work; at vertical joints in walls; at joints in girders, beams, supported slabs and other structural members; and at joints designed to contain liquids; dampen, but do not saturate, the roughened and cleaned surface of set concrete and apply a liberal coating of neat cement grout.
3) Use neat cement grout consisting of equal parts Portland cement and fine aggregate by weight and not more than 6 gallons of water per sack of cement. Apply with a stiff broom or brush to a minimum thickness of 1/16". Deposit fresh concrete before cement grout has attained its initial set.
4) In lieu of neat cement grout, bonding grout may be commercial bonding agent. Apply to cleaned concrete surfaces in accordance with the printed instructions of the bonding material manufacturer.

21. Construction joints: Construction joints shall be located as shown on the plans and at other points as may be necessary during construction provided that the location and nature of additional joints shall be accepted by the City of Stillwater. In general, joints shall be located at points of minimum shear, shall be perpendicular to the principal lines of stress, and shall have suitable keys having areas of approximately one-third (1/3) of the area of the joints. When placing against a construction joint, the surface of the concrete previously placed shall be thoroughly cleaned of dirt, scum, laitance or other soft material, and shall be roughened. The surface shall then be thoroughly washed with clean water and covered with at lease 2 inches of cement mortar, after which concreting may proceed. Mortar shall be placed in a manner that will not splatter forms and reinforcing steel.
22. Finish of concrete surfaces: All surfaces exposed to view shall be free from conspicuous lines, affects or other irregularities caused by defects in the forms. If for any reason this requirement is not met, or if there are any conspicuous honeycombs, the City of Stillwater may require a correction of the defects by rubbing with carborundum bricks and water until a satisfactory finish is obtained. Immediately after removing the forms, all wires or other exposed metal shall be cut back of the concrete surface and the depressions thus made and all honeycomb and other defects shall be painted with mortar and then rubbed smooth. If the City of Stillwater deems any honey comb or other defect to require such treatment, the defective concrete shall be cut out to a depth sufficient to expose the reinforcement and to afford a key for the concrete replacing the cut out.
23. Curing concrete:
    a) Exposed surfaces of concrete shall be protected by accepted methods from premature drying for a period of at least seven (7) days. Curing compounds, when accepted by the City of Stillwater, shall be applied according to the manufacturer's recommendations and shall not be used on any surface against which additional concrete is to be bonded, nor on surfaces which will be painted. In dry, hot weather, forms shall be removed as early as practicable and curing started immediately. The City of Stillwater may require the frequent wetting of the concrete and the use of means to protect it from the direct rays of the sun.
        1) The Contractor shall protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.
        2) The Contractor shall start initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing and weather permitting, keep continuously moist for not less than 72 hours.
        3) The Contractor shall begin final curing procedures immediately following initial curing and before the concrete has dried; continue final curing for at least 7 days and in accordance with ACI 301 procedures; and avoid rapid drying at the end of the final curing period.

b) Water curing: The Contractor shall moist cure the concrete using only water that is free of impurities which could etch or discolor exposed, natural concrete surface. The methods are as follows:
   1) Keeping the surface of the concrete continuously wet by covering with water.
   2) Continuous water-fog spray.
   3) Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with a 4 inch lap over adjacent absorptive covers.

c) Moisture Retaining Cover: The Contractor shall provide moisture retaining cover curing as follows: Cover the concrete surfaces with the specified moisture-retaining cover for curing concrete, placed in the widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

d) Liquid membrane cover: The Contractor shall provide liquid membrane curing as follows:
   1) Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly in a 2-coat continuous operation by power spray equipment in accordance with the manufacturer's directions. Re-coat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain the continuity of the coating and repair damage to the coat during the entire curing period.
   2) Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the City of Stillwater.

e) Curing formed surfaces: The Contractor shall cure formed concrete surfaces, including the undersides of girders, beams, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed prior to specified curing period, continue curing by one of the methods specified in "Curing Unformed Surfaces".

f) Curing unformed surfaces: The Contractor shall immediately after finishing operation is complete, commence curing unformed surfaces by one of the following methods:
   1) Continuously sprinkle or pond surface with water. Use this method for footings only.
   2) Cover surface with 2 inches of moist sand. Keep sand moist throughout the curing period. Use this method for footings only.
   3) Cover surface with moist fabric. Keep fabric moist and in direct contact with surface so that a film of water remains on the surface throughout the curing period. This method may be used on all concrete surfaces.
   4) Cover surface with curing paper. Lap sides and ends at least 3 inches and seal with tape. This method may be used on all concrete surfaces.
   5) Apply a uniform coat of liquid curing compound in accordance with manufacturer's recommendations. This method may be used on all concrete surfaces except those scheduled to receive bonded materials. Do not use this method in hot weather.

g) Temperature of concrete during curing:
   1) When the atmospheric temperature is 40° F and below, the Contractor shall maintain the concrete temperature between 50° F and 70° F continuously throughout the curing period. When necessary, make arrangements before concrete placing for heating, covering, insulating, or housing, as required to maintain the specified temperature and moisture conditions, continuously for the concrete curing period. Do not use combustion the first 24 hours of curing without taking precautions to prevent exposure of the concrete to exhaust gases. Provide cold weather protection complying with the requirements of ACI 306.

2) When the atmospheric temperature is 80° F, and above or during other climatic conditions which will cause too rapid drying of the concrete, the Contractor shall make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture retaining covering. Protect the concrete continuously for the concrete curing period. Provide hot weather protection complying with the requirements of ACI 305. Maintain temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5 degrees F. in any one hour and 50 degrees F. in any 24 hour period.

h) Protection from mechanical injury:
   1) During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations. Do not allow any traffic (except for curing purposes) on the concrete surfaces until the concrete has attained 60% of its 28-day strength.
   2) Removal of forms: Forms shall be removed in such manner as to ensure the complete safety of the structure. No forms shall be removed except with the express permission of the City of Stillwater. In general, acceptance will be based on the following:
      A. Forms on ornamental work, railings, parapets and vertical surfaces which do not carry loads and which will be exposed in the finished work shall be removed within twenty-four (24) hours to forty-eight (48) hours after placing, as long as the temperature has been above 50° F the entire duration and the concrete hardness is such that the form removal will not damage the surface.
      B. Form work supporting weight of concrete, such as beam soffits, joists, and slabs and other structural elements shall not be removed in less than fourteen (14) days and not until concrete has attained the design minimum twenty-eight (28) day compressive strength. Determine potential compressive strength of in-place concrete location or members under the least favorable conditions prevailing for any portion of the concrete.
      C. Girder, beam and joint soffit forms shall remain in place with adequate shoring underneath, and no construction load shall be supported upon nor any shoring removed from any part of the structure under construction until that portion of the structure has attained sufficient strength to support safely its weight and the loads placed thereon.
      D. Form facing material may be removed four (4) days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

i) Re-use of forms:
   1) The Contractor shall form lumber which is to be used a second time shall be free from bulge or warp and shall be thoroughly cleaned and repaired. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. The Contractor shall apply new form coating compound material to concrete contact surfaces as specified for new form work.
   2) When forms are extended for successive concrete placement, the Contractor shall thoroughly clean surfaces, remove fins and latence, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Owner's Representative.

j) Concrete surface repairs:
   1) Patching defective areas
      A. The Contractor shall repair and patch all defective areas with cement mortar immediately after removal of forms, but only when directed by the City of Stillwater.
      B. The Contractor shall cut out honeycomb and rock pockets, down to concrete but, in no case, to a depth of less than 1 inch. In no case shall reinforcing metal be cut into.

Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to the City of Stillwater.

C. For exposed-to-view surfaces, the Contractor shall blend white portland cement and standard portland cement so that, when dry, the patching mortar will match the color of the surrounding concrete. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with the patching. Compact mortar in place and strike off slightly higher than the surrounding surface.

D. The Contractor shall fill holes extending through concrete by means of a plunger-type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to insure complete filling.

2) Repair of formed surfaces

A. The Contractor shall repair of exposed-to-view formed concrete surfaces where possible, that contain defects which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the City of Stillwater. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by the rods and bolts; fins and other projections on the surface; and stain and other discoloration that cannot be removed by cleaning.

B. The Contractor shall repair concealed formed concrete surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects, as such, include cracks in excess of 0.01 inch wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts and spalls except minor breakage at the corner.

3) Repair of unformed surfaces:

A. The Contractor shall test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish. The Contractor shall correct low and high areas as herein specified.

B. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope, Correct high and low areas as herein specified.

C. Repair finished unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects as such, include cracking, (cracks in excess of 0.01" wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width) spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

D. Correct high areas in unformed surfaces by grinding, after the concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.

E. Correct low areas in formed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.

F. Repair defective areas, except random cracks and single holes not exceeding 1 inch diameter, but cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4" clearance all around. Dampen all concrete surfaces in contact with patching concrete and brush with a neat cement grout coating, or use concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials to provide compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

G. Repair isolated random cracks and single holes not over 1 inch in diameter by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place drypack before the cement grout takes its intial set. Mix drypack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact drypack mixture in place and finish to match adjacent concrete. Keep patch areas continuously moist for not less than 72 hours.

H. Repair methods not specified above may be used, subject to the acceptance of the City of Stillwater.

END OF SECTION

LIST OF DOCUMENTS REQUIRED FOR THIS BID

Project Numbers: **SUA Project No. 13WG02/SUA Bid No 25-12/13**

Description: **Equipment Building at the Stillwater Water Treatment Plant**

The Bidder is responsible for reviewing this list of required documents and any requirements contained within the Project Manual and assuring that each and every required document is properly completed, signed, and submitted with the Bid. Forms and Affidavits should be completed and submitted in accordance with provisions of the "Signature Requirements for Bidding Documents."

DOCUMENTS REQUIRED FOR THIS BID

Submit one original and two copies of the following documents:

1. Detailed Bid Form
2. Bid Bond (Bid Security)
3. Business Relationship Affidavit
4. Non-Collusion Affidavit
5. Certificate of Non Discrimination
6. List of three (3) references
7. Manufacturer of pre-engineered steel building or design engineer qualifications
8. Submit plan/specification of one (1) EXAMPLE project with similar complexity and quality including the following:
   a) structural specifications,
   b) foundation plan,
   c) floor plan,
   d) structural framing plan,
   e) electrical one-line and panel plan,
   f) electrical outlet and lighting plan,
   g) architectural isometric rending
9. Submittal packages for specific equipment proposed for THIS BUILDING:
   ~~a) electrical, lighting, and convenience outlets~~
   ~~b) heating and exhaust fans,~~
   ~~c) insulation and roofing,~~
   ~~d) roll-up doors and personnel doors~~

   a) Pre-engineered building manufacturer's conceptual design and specifications to include at a minimum:
   - Load Parameters (wind, snow, live, etc.)
   - Architectural isometric rendering
   - Structural isometric sketch or framing plan and elevation views to include roof system.
   - Material description to include structural steel, wall sheathing and roof decking.

For the purpose of determining that a Bid is properly submitted, Bidder should submit the properly completed and executed documents listed on this page. Failure to submit a required document may be cause for rejection of the Bid.

Forms Not in Packet. If an item is listed on this page and the form is not included in this packet, it is the Bidder's responsibility to obtain the form from the City of Stillwater or such other office noted in the Notice to Bidders.

Forms to be Used. Bidder shall use the forms in this Bid Package or shall photocopy the forms and complete them. No alterations can be made to the forms except to add additional signature lines as required. Bids submitted with any other alteration or amendment of these forms may be considered non-responsive.

This space intentionally left blank.

ARTICLE 6 TIME OF COMPLETION

6.01 BIDDER agrees that the Work will be substantially complete in accordance with the Special Provisions and paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with the Special Provisions and paragraph 14.07.B of the General Conditions.

6.02 BIDDER agrees to pay Liquidated Damages as provided for in the Special Provisions.

ARTICLE 7 ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid (reference Section H: List of Documents Required for This Bid):

A. Required Bid security in the form of cashier's check or bond for 5% of bid amount;
B. Non-Collusion Affidavit;
C. Business Relationships Affidavit;
D. Certificate of Non-Discrimination
E. List of three (3) references/qualifications statement
F. Manufacturer of pre-engineered steel building or design engineer qualifications
G. SAMPLE project submittals as described in the List of Documents Required.
I. Submittal packages for specific equipment proposed for THIS BUILDING as described in the List of Documents Required-As Revised by Addendum No. 2 dated May 31, 2013.

SUBMIT ONE ORIGINAL AND TWO COPIES OF ALL DOCUMENTS REQUIRED

ARTICLE 8 DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 BID SUBMITTAL

9.01 This Bid is submitted by:

❒An Individual

Name (typed or printed):_____

By_____(SEAL)
(Individual's Signature)

doing business as _____

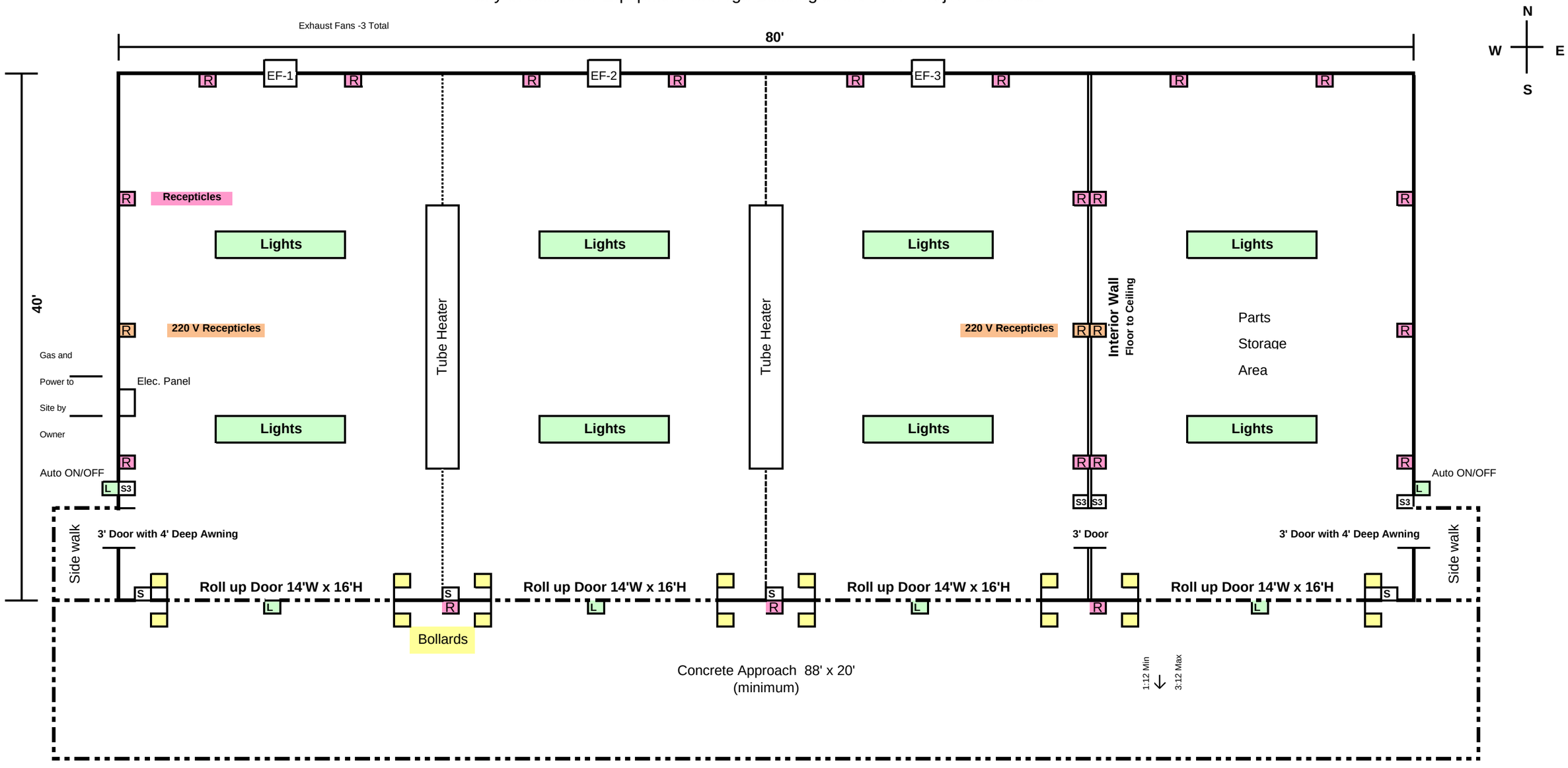
Business address _____

Telephone number _____ FAX number_____

SS# or FED I.D.#_____

ATTACHMENT 1- Revised Per Addendum No. 2 dated May 31, 2013

City of Stillwater Equipment Storage Building at the WTP-Project 13WG02



Notes

1 All T-5 Flourscent Lights and 110V Outlets shall be on separate circuits.
2 Provide long eaves to keep rain water from splashing and deteriorating metal siding
3 Provide 3-way switches at service entrances and thru doors. Provide single switches to each outdoor overhead light.
4 Outdoor Recepticles between bays shall be waterproof.
5 Open Bays with vertical clear span of 18 feet.

REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL EVALUATION

PROPOSED METAL BUILDING – WATER TREATMENT PLANT
STILLWATER, OKLAHOMA
BUILDING & EARTH PROJECT NO. OK13092

PREPARED FOR:
CITY OF STILLWATER

PREPARED BY:

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

DATE:
MAY 30, 2013

BUILDING & EARTH
Geotechnical, Environmental and Materials Engineers
10828 East Newton, Suite 111 • Tulsa, OK 74116-5662 • Ph: (918) 439-9005 • Fax: (918) 439-9255
www.BuildingAndEarth.com

May 30, 2013

Mr. Anthony Daniel
City of Stillwater, Water Utilities
723 S. Lewis Street
Stillwater, OK 74074

Subject: Report of Subsurface Exploration
and Geotechnical Evaluation
Proposed Metal Building
Water Treatment Plant
Stillwater, Oklahoma
Building & Earth Project No. OK13092

Dear Mr. Daniel:

Building & Earth Sciences, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation for the proposed metal building at the Water Treatment Plant in Stillwater, Oklahoma. Our services were performed in general accordance with our proposal number OK15114, dated May 22, 2013.

The purpose of this exploration and evaluation was to assess the general subsurface conditions at the site and to provide recommendations for site grading and foundation design for the proposed building. The recommendations in this report are based on a geotechnical reconnaissance of the site and observation and classification of samples obtained from two (2) soil test borings drilled at the site. Confirmation of the anticipated subsurface conditions during construction is an essential part of geotechnical services.

We appreciate the opportunity to provide consultation services for the subject project. If you have any questions regarding the information in this report or need any additional information, please contact the undersigned.

Respectfully Submitted,
BUILDING & EARTH SCIENCES, INC.
Certificate of Authorization #3975, Expires 6/30/2014

M. Dharmateja

Dharmateja Maganti, E.I.T.
Project Engineer

Mark Nolen, P.E.
Regional Vice President
OK22170

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1.0 SITE AND PROJECT DESCRIPTION

The project site is located at 1022 West Yost Street in Stillwater, Oklahoma. The project site is located on the northwest corner of North Washington Street and Yost Road. Based on the information provided to our office, we understand that an 80' x 40' metal building is planned on the northeast corner of the water treatment plant property. Figure 1 shows the approximate location of the project site.

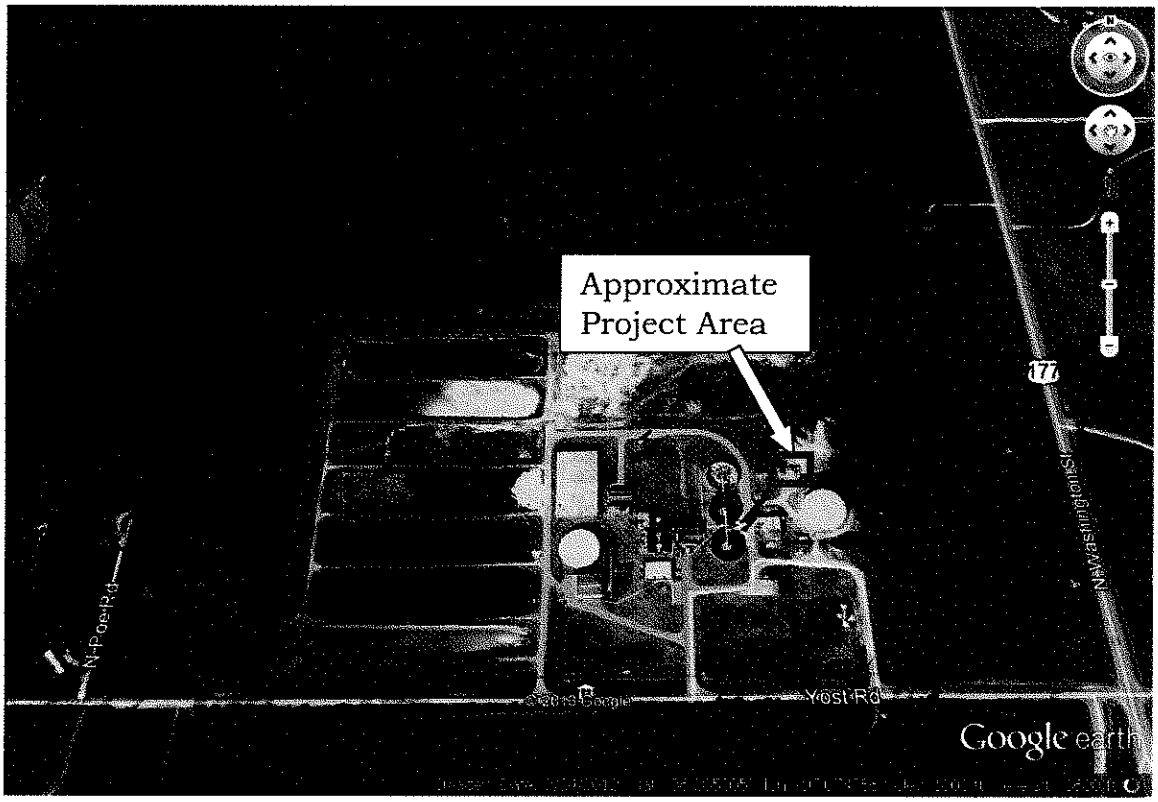


Figure 1. Approximate Project Site Location

At the time of the subsurface exploration the project site was fairly level with an estimated grade differential on the order of 1 to 2 feet across the proposed project area.

Structural loads were not provided; however, we assumed that the proposed building will be lightly loaded with maximum column loads and bearing wall loads in the range of 20 to 40 kips, and 2 to 3 kips per linear foot (klf), respectively.

Proposed grading plans were not provided to us at the time of preparing this proposal; however, for the purpose of this proposal we assumed that maximum cut and fill depths of less than 2 feet will be required to achieve design grades within the proposed building area.

2.0 SCOPE OF SERVICES

The purpose of the geotechnical exploration was to determine general subsurface conditions at specific boring locations and to gather data on which to base a geotechnical evaluation with respect to the proposed construction. The information gathered from the exploration was evaluated to determine suitable foundation alternatives for the proposed building. The information was also evaluated to help determine if any special building pad preparation procedures will be required during the earthwork phase of the project. The work included soil test borings, laboratory analysis, and geotechnical evaluation appropriate to address the geotechnical aspects of the proposed construction. The results of our exploration presented in this report address the following:

- General site geology.
- Summary of existing surface conditions.
- A description of the subsurface conditions encountered at the soil test boring locations including a description of the groundwater conditions observed in the boreholes during drilling. Long-term monitoring was not included in our scope.
- Presentation of laboratory test results.
- Site preparation considerations including material types to be expected at the site, treatment of unsuitable soils, if encountered, excavation considerations, and surface drainage.
- Recommendations to be used for foundation design, including appropriate foundation types, bearing pressures, and depths.
- Recommendations to be used for design of slabs-on-grade, including modulus of subgrade reaction.
- Seismic Site Classification, according to 2009 International Building Code.
- Presentation of expected total and differential settlements, and recommendations to reduce the expected movements, if appropriate.
- Compaction requirements and recommended criteria to establish suitable material for structural backfill.

3.0 GENERAL SITE GEOLOGY

According to the *Reconnaissance of the Water Resources of the Enid Quadrangle, North-Central Oklahoma*, second printing 1991, the general geology at the site is underlain by Permian Age, Wellington Formation. This group is described as mainly fine-grained sandstone and mudstone conglomerate.

4.0 FIELD EXPLORATION

The authorized subsurface exploration was performed on May 20 and 21, 2013. The subsurface exploration presented in this report consisted of two (2) soil test borings drilled within the proposed building area. Borings B-1 and B-2 were drilled to a depth of approximately 14.5 feet below existing ground surface within the proposed building area on the east and west ends, respectively.

The soil boring locations were determined in the field by a representative of City of Stillwater. The approximate boring locations are indicated on the Boring Location Plan included in the Appendix of this report.

The borings were drilled with by Data Testing with a truck mounted drill rig equipped with solid stem augers and automatic hammer. At each boring location, soil samples were retrieved at standard sampling intervals by driving a split-tube sampler.

The borehole was first advanced to the sample depth by augering, and the sampling tools were placed in the open hole. The sampler was then driven into the ground 18 inches by blows from a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler each 6-inch increment was recorded. The initial increment is considered the "seating" blows, where the sampler penetrates any loose or disturbed soil in the bottom of the borehole. The blows required to penetrate the final two increments are added together, and referred to as the Standard Penetration Test (SPT) N-Value. The N-Value, when properly evaluated, gives an indication of the soil's strength and ability to support structural loads. Many factors can affect the SPT N-Value, so this result should not be used exclusively to evaluate soil conditions.

Samples retrieved from the boring locations were labeled and stored in plastic bags at the jobsite before being transported to our laboratory for analysis. The project engineer prepared Boring Logs summarizing the subsurface conditions at the boring locations. The Boring Logs are included in the Appendix of this report.

5.0 LABORATORY ANALYSIS

After the soil samples were visually classified, specific samples were selected by the project engineer for laboratory analysis. The laboratory analysis consisted of ten (10) natural moisture content tests, one (1) Atterberg limits test and one (1) Wash #200 tests.

The results of the laboratory analysis are presented on the boring logs in the Appendix of this report. A brief description of the laboratory tests performed is provided in the following sections.

5.1 DESCRIPTION OF SOILS (VISUAL-MANUAL PROCEDURE) (ASTM D 2488)

The soil samples were visually examined by the project geotechnical engineer who provided soil descriptions. Representative samples were then selected and tested in accordance with the aforementioned laboratory-testing program to determine soil classifications and engineering properties. This data was used to correlate the visual descriptions with the Unified Soil Classification System (USCS).

5.2 NATURAL MOISTURE CONTENT (ASTM D 2216)

Natural moisture contents were determined on selected samples. The natural moisture content is the ratio, expressed as a percentage, of the weight of water in a given amount of soil to the weight of solid particles.

5.3 ATTERBERG LIMITS (ASTM D 4318)

Atterberg Limits tests were performed to evaluate the soils' plasticity characteristics. The Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The LL is the moisture content at which the soil will flow as a heavy viscous fluid. The PL is the moisture content at which the soil is between "plastic" and the semi-solid stage. The Plasticity Index (PI = LL - PL) is a frequently used indicator for a soil's potential for volume change. Typically, a soil's potential for volume change increases with higher plasticity indices.

5.4 PARICLE SIZE ANALYSIS (ASTM D 422)

A particle-size test was performed to determine the soil particle size distribution. The grain-size distribution of the soil retained on the No. 200 sieve was determined by passing the retained portion through a standard set of nested sieves. The results are shown on the table below.

5.5 SUMMARY OF LABORATORY TEST RESULTS

Atterberg limits and wash #200 test was performed on a sample. The results of the laboratory testing are presented in the following table.

Summary of Laboratory Test Results							
Boring No.	Sample Depth (ft)	Atterberg Limits			% Passing No. 200 Sieve	Moisture Content (%)	Soil Description (USCS Classification)
		LL	PL	PI			
B-2	0.5-2.0	22	16	6	36.3	7.8	Silty Clayey Sand (SC)

6.0 GEOTECHNICAL SITE CHARACTERIZATION

The subsurface conditions at the site were evaluated by observation and classification of soil samples obtained from two (2) soil test borings drilled within proposed building area.

The conditions between the borings are assumed to be similar to the conditions encountered at the boring locations. The following conditions and subsequent recommendations are based on the presumption that no significant changes in subsurface conditions occur between boreholes. However, anomalous conditions can occur due to the geologic conditions at the site, and it will be necessary to verify the assumed conditions during site grading and foundation installation.

6.1 SURFACE CONDITIONS

At the time of the subsurface exploration the site was fairly level with an estimated grade differential on the order of 1 to 2 feet across the proposed project area.

6.2 TERRACE DEPOSITS

Terrace deposits were encountered in Borings B-1 and B-2 at the surface and continued to depths of about 1 to 2 feet. The terrace deposits consisted of dense silty clayey sand (SC-SM). The Standard Penetration Test (SPT) N-values in the sandy soils were 22 and 33 bpf. The sands were gray-brown, orange-brown and orange in color. The moisture contents of the sandy soils were 7 and 8 percent. Atterberg limits tests performed on a sample of silty clayey sand indicated Liquid Limit (LL) value of 22, plastic limit (PL) value of 16 and plasticity index (PI) value of 6. About 36 percent of the sand material passed the No. 200 sieve.

6.3 INETERLAYERED SANDSTONE AND LEAN CLAY

Interlayered sandstone and lean clay was encountered in Borings B-1 and B-2 below the clayey sands and continued to depths of about 6.2 to 7 feet below the existing ground surface. The Interlayered sandstone and lean clay were orange-brown, tan, yellow, grayish tan and reddish brown in color. The SPT N-values in this zone typically ranged from 29 to 61 blows per foot (bpf). The moisture contents in this unit ranged from 7 to 12 percent.

6.4 HIGHLY WEATHERED MUDSTONE UNIT

Highly weathered mudstone was encountered below the inlerlayered sandstone and lean clay layer in both the borings. The highly weathered mudstone unit continued to a boring termination depth of 14.3 feet. The mudstone unit was red, reddish brown and grayish tan in color. The SPT N-values in the mudstone unit typically ranged from 42 blows per foot (bpf) to 50 blows per 3 inches of

penetration. The moisture contents in the mudtone unit ranged from 10 to 14 percent.

6.5 GROUNDWATER

Groundwater was not encountered in the borings while drilling and the borings were dry upon completion of drilling and prior to backfilling. Fluctuations in the water level can occur due to seasonal rainfall. Water levels as observed during drilling are accurate for only the time and date that the boring was drilled. Short term groundwater level readings may not accurately reflect the actual groundwater levels at the borings.

7.0 SITE GRADING CONSIDERATIONS

Proposed grading plans were not provided to us at the time of preparing this report; however, for the purpose of this report we assumed that maximum cut and fill depths of 2 feet or less will be required to achieve design grades within proposed building area.

The primary geotechnical considerations for development of the project site include:

- The moisture sensitivity of the silty clayey sand encountered across the project site.
- The presence of Interlayered sandstone and lean clay unit below the clayey sand at depth of 1 to 2 feet below the existing ground surface.
- The presence of moderately hard mudstone unit at a depth of about 14 feet below existing ground surface.

7.1 INITIAL SITE PREPARATION

All vegetation, topsoil, or any other deleterious materials should be removed from the proposed construction areas prior to placing fill or constructing the foundations or slab-on-grade.

Existing utility lines are anticipated within the proposed building area. We recommend that existing underground utility lines be rerouted to areas outside the proposed building footprint and the utility line trenches backfilled with properly compacted structural fill. If existing utility lines remain in-place, we recommend that the condition of the backfill material be thoroughly evaluated by means of test pit excavations. Unsuitable backfill materials encountered in the utility trenches should be undercut and replaced with properly compacted structural fill.

During site preparation activities, the contractor should identify materials that will be used as fill and provide samples to the testing laboratory to evaluate the suitability for use as structural fill and to determine appropriate moisture-density curves.

7.2 MOISTURE SENSITIVE SOILS

The silty clayey sand encountered in the borings exhibited low plasticity characteristics with significant silt fraction. These types of materials are sensitive to slight increases in soil moisture contents. The contractor should anticipate some difficulty during the earthwork phase of this project if moisture levels are moderate to high during construction. Increased moisture levels will soften the subgrade soils and the soils will lose stability under the influence of repeat construction traffic loading.

7.3 SUBGRADE PREPARATION AND EVALUATION

After initial site preparation, the proposed construction area should be carefully proofrolled with a heavy, rubber-tired vehicle prior to fill placement or building construction. The proofrolling will help densify the near surface soils and identify unstable subgrade areas. The project geotechnical engineer or a qualified representative should observe the proofrolling operations.

Considering that the onsite materials encountered in the borings are mostly comprised of fine grained, silty clayey sand and depending on the moisture contents at the time of construction, proofrolling may reduce the stability of the subgrade soils. If this occurs, the general procedures should be modified such as deleting or reducing the proofrolling, or stabilizing the soils.

Any soft, very loose, unstable, or otherwise unsuitable soils identified during the proofrolling or subgrade evaluation process should be moisture conditioned, undercut to suitable material, or stabilized in place prior to fill placement or new construction. Information regarding suitable stabilization methods can be provided during construction, based on actual conditions encountered.

7.4 STRUCTURAL FILL

We recommend that the structural fill at the site be composed of material with a maximum dry density in excess of 100 pounds per cubic foot (pcf), Plasticity Index (PI) less than 20, and Liquid Limit (LL) less than 45. All structural fill materials should be free of any organics, should not contain rock fragments greater than 3 inches in any dimension, and should be properly moisture conditioned prior to placement. Any fill to be placed at the site should be approved by the geotechnical engineer.

Based upon the soils encountered in the borings, the onsite materials appear suitable for use as structural fill. The site soils consist mostly of fine-grained, silty clayey sands (SC-SM), which are prone to losing stability with slight increases in soil moisture levels. The contractor should use care during fill placement to prevent over wetting of the soils and to limit repeat construction traffic, as this will increase the risk of these soils losing stability. We recommend that bulk samples of the onsite soils be collected during initial site preparation for further laboratory testing to evaluate their suitability for use as structural fill. Any fill to be placed at the site should be approved by the geotechnical engineer.

The structural fill should be compacted to a minimum of 95% of the standard Proctor maximum dry density and within ±2% of the optimum moisture as determined by ASTM D698. The specifications should state that both density and moisture requirements should be met. The lifts should not exceed 8 to 12 inches thick, depending on the compaction equipment used. Density and moisture tests should be performed on each lift prior to placement of subsequent lifts.

7.5 UTILITY TRENCH BACKFILL

All utility trenches in the proposed building addition area must be backfilled and compacted in the manner specified above for structural fill. It may be necessary to reduce the lift thickness to 4 to 6 inches to achieve compaction using hand-operated equipment.

7.6 EXCAVATION CONSIDERATIONS

Based on the information gathered during our subsurface exploration, we anticipate that the overburden soils and Interlayered sandstone and lean clay units can be excavated using a backhoe in good working condition. Excavation in the moderately hard mudstone unit will likely require large track hoe in good working condition, equipped with rock teeth below depth of about 14 feet.

The ability to excavate weathered rock or hard rock is a function of the material, the equipment used, the skill of the operator, the desired rate of removal and other factors. The contractor should review the borings logs and should use his own method to evaluate excavation difficulty

7.7 DRAINAGE CONSIDERATIONS

The potential for soil moisture fluctuations within building area subgrades should be reduced to lessen the potential of subgrade movement. Site grading should include positive drainage away from the proposed building addition.

7.8 WET WEATHER CONSTRUCTION

Cooler temperatures and shorter days during the winter season significantly reduce the capacity to dry out wet soils. Additionally, excessive movement of construction equipment across the site during wet weather will result in ruts, which will collect rainwater, prolonging the time required to dry the subgrade soils.

During rainy periods, additional effort will be required to properly prepare the site and establish/maintain an acceptable subgrade. The difficulty will increase in areas where silty soils are exposed at the subgrade elevation. Grading contractors typically postpone grading operations during wet weather to wait for conditions that are more favorable. Contractors can typically disk or aerate the upper soils to promote drying during intermittent periods of favorable weather. When deadlines restrict postponement of grading operations, additional measures such as undercutting and replacing saturated soils or stabilization can be utilized to facilitate placement of additional fill material.

8.0 FOUNDATION RECOMMENDATIONS

Structural loads were not provided; however, we assumed that the proposed building will be lightly loaded with maximum column loads and bearing wall loads in the range of 20 to 40 kips, and 2 to 3 kips per linear foot (klf), respectively.

Based on the information provided and the results of our field exploration, the subsurface conditions are suitable to support the proposed building on shallow footings. Footings bearing in Interlayered sandstone and lean clay unit can be dimensioned for a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf).

Total settlement of footings designed and constructed as recommended above is estimated to be less than ¾ inch. Differential settlement of footings designed and constructed as recommended above should be within the tolerable limits addressed above. Differential settlement between the proposed building addition and the existing structures could approach ¾ inch. Consideration should be given to the use of expansion joints between the proposed building addition and existing structures.

Exterior and perimeter footings should be extended to a minimum depth of 24 inches below finished exterior grades. Even though computed footing dimensions may be less, column footings should be at least 24 inches wide and strip footings should be at least 16 inches wide. These dimensions facilitate hand cleaning of footing subgrades disturbed by the excavation process and the placement of reinforcing steel. They also reduce the potential for localized punching shear failure.

The following items should be considered during the preparation of construction documents and foundation installation:

- The geotechnical engineer of record should observe the exposed foundation bearing surfaces prior to concrete placement to verify that the conditions anticipated during the subsurface exploration are encountered.

- All bearing surfaces must be free of soft or loose soil prior to placing concrete.

- The bottom surface of all footings should be level

- Concrete should be placed the same day the excavations are completed and bearing materials verified by the engineer. If the excavations are left open for an extended period, or if the bearing surfaces are disturbed after the initial observation, then the bearing surfaces should be re-evaluated prior to concrete placement.

- Water should not be allowed to pond in foundation excavations prior to concrete placement or above the concrete after the foundation is completed.

- Wherever possible, the foundation concrete should be placed "neat", using the sides of the excavations as forms. Where this is not possible, the excavations created by forming the foundations must be backfilled with suitable structural fill and properly compacted.

- The building pad should be sloped to drain away from the building foundations.

- Roof drains should be routed away from the foundation soils.

9.0 FLOOR SLABS

Site grading recommendations presented in Section 7 of this report should be followed to provide for subgrade conditions suitable for support of grade supported slabs. All slabs must be supported on a properly prepared subgrade that was evaluated by the geotechnical engineer prior to base stone placement.

At a minimum, the floor slabs should be supported on a four-inch thick compacted layer of free-draining, granular material, such as ASTM No. 57 stone. The purpose of this layer is to serve as a leveling course and act as a capillary break for moisture migration through the subgrade soil.

An effective modulus of subgrade reaction of 130 pci can be used in the design of grade supported building floor slabs.

Depending on the proposed floor covering, consideration should be given to the use of a polyethylene vapor barrier.

10.0 SEISMIC SITE CLASSIFICATION

Based on the 2009 Edition of the International Building Code, the subsurface conditions encountered in the borings, and our knowledge of the geologic conditions of the site, we recommend that the site be classified as Site Class C. Our subsurface exploration extended to a maximum depth of about 14 feet; hence the seismic site classification should be re-evaluated in the event subsurface information is made available to a depth of 100 feet.

11.0 CONSTRUCTION MONITORING

The recommendations presented in this report are based on information obtained from two (2) soil test boring locations. Field verification of site conditions is an essential part of the services provided by the geotechnical consultant. In order to confirm our recommendations, it will be necessary for Building & Earth personnel to make periodic visits to the site during site grading. We can prepare a proposal for construction monitoring services based on the construction schedule and your risk management preferences.

Typical construction monitoring services are listed below.

- Periodic observations and consultations by a member of our engineering staff during site grading.
- Field density tests during structural fill placement.
- Observation and verification of the bearing surfaces exposed after foundation excavation.
- Molding and testing of concrete cylinders.
- Structural steel inspections.

12.0 CLOSING

This report was prepared for use by City of Stillwater, Water Utilities for specific application to the subject project. The information in this report is not transferable. This report should not be used for a different development on the same property without first being evaluated by the engineer. The recommendations in this report were based on the information obtained during the field exploration, laboratory analysis and engineering judgment regarding conditions between borings. The anticipated subsurface conditions should be confirmed during site grading and foundation installation.

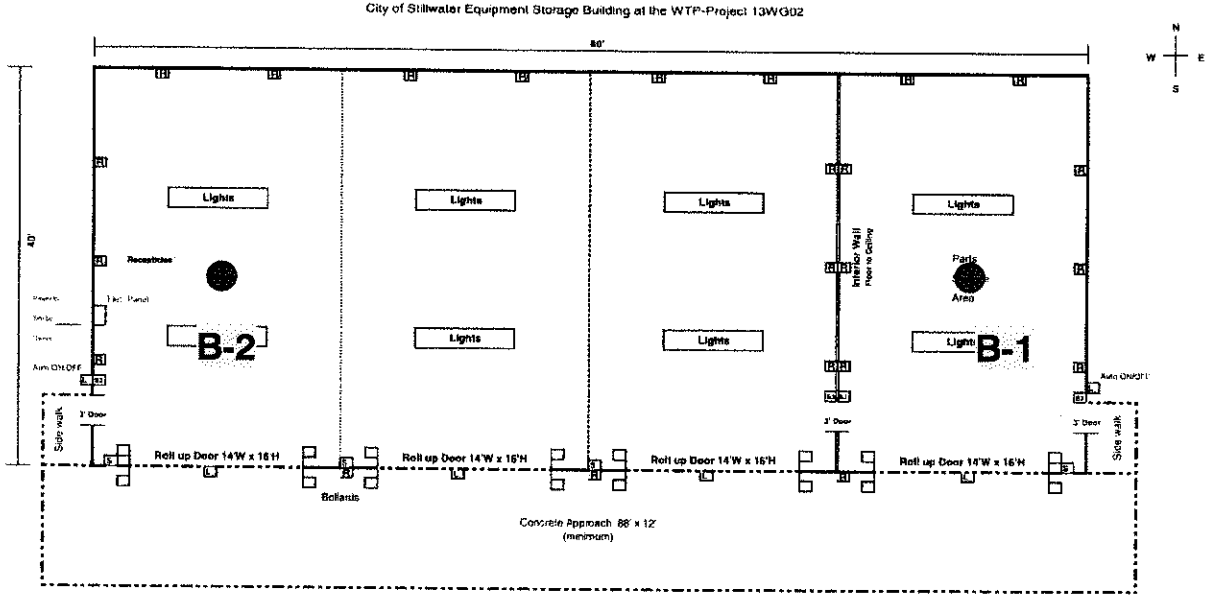
This report is intended for use during design and preparation of specifications and may not address all conditions at the site at the time of construction. Contractors reviewing this information should acknowledge that this document is for design information only.

An article published by the Association of Engineering Firms Practicing in the Geosciences (ASFE), titled *Important Information About Your Geotechnical Report*, has been included in the Appendix. We encourage all individuals to become familiar with the article to help managing risk.

APPENDIX

N

ATTACHMENT 1
City of Stillwater Equipment Storage Building at the WTP-Project 13WG02



Notes
1. All T-8 Flourescent Lights and 110V Outlets shall be on separate circuits
2. Provide long eaves to keep rain water from splashing and deteriorating metal siding
3. Provide 3-way switches at service entrances and thru doors. Provide single switches to each outdoor overhead light
4. Outdoor Receptacles between bays shall be waterproof.

REFERENCE USED TO PRODUCE THIS DRAWING: *Site Plan, provided by City of Stillwater*	**BORING LOCATION PLAN**	**DATE:** **5/29/2013**	BUILDING & EARTH Geotechnical, Environmental, and Materials Engineers
	PROJECT NO: OK13092	**Proposed Metal Building** **Water Treatment Plant** Stillwater, Oklahoma	**SCALE: NTS**

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING

Designation: B-1

Sheet 1 of 1

10828 E. Newton St, Suite 111
Tulsa, OK 74116
Office: (918) 439-9005
Fax: (918) 439-9255
www.BuildingAndEarth.com

Project Name: Proposed Metal Building - Water Treatment Plant
Project Number: OK13092
Drilling Method: Solid Stem Auger
Equipment Used: Giddings
Hammer Type: Automatic
Boring Location: East Hole

Project Location: Stillwater, Oklahoma
Date Drilled: 5/20/13
Weather Conditions:
Surface Elevation:
Drill Crew: Data Testing, Inc.
Logged By: Teja Maganti, E.I.T

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	N-Value / Qu (tsf) / Atterberg Limits / % Moisture	SOIL DESCRIPTION	GRAPHIC	REMARKS
			1	15-15-18		SILTY CLAYEY SAND (SC-SM): gray-brown and orange pockets, with sandstone fragments, trace to low plasticity, moist, dense		
						1.0 INETERLAYERED SANDSTONE AND LEAN CLAY: orange, tan and brown, low plasticity, moist, poorly cemented		
			2	26-18-43		- orange-brown and yellow, with grayish tan lean clay layers		
5			3	10-21-15		- reddish brown and grayish tan, medium plasticity		
						6.2 HIGHLY WEATHERED MUDSTONE: red and reddish brown, medium plasticity, moist, soft		
			4	11-18-24				
10								
			5	35-50/3"		- reddish brown and grayish tan		
						14.3 - moderately hard		
15						Boring Terminated at 14.3 feet. Boring Backfilled on 5-20-13.		Groundwater seepage not encountered while drilling and boring dry upon completion

SAMPLE TYPE ☒ Split Spoon

N-VALUE STANDARD PENETRATION RESISTANCE (AASHTO T-206)
% MOISTURE PERCENT NATURAL MOISTURE CONTENT
▽ GROUNDWATER LEVEL IN THE BOREHOLE
Qu UNCONFINED COMPRESSIVE STRENGTH ESTIMATE FROM POCKET PENETROMETER TEST
REC RECOVERY
RQD ROCK QUALITY DESIGNATION
UD UNDISTURBED

LOG OF BORING 2 OK13092.GPJ BESI.GDT 5/30/13

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING

Designation: B-2

Sheet 1 of 1

10828 E. Newton St, Suite 111
Tulsa, OK 74116
Office: (918) 439-9005
Fax: (918) 439-9255
www.BuildingAndEarth.com

Project Name: Proposed Metal Building - Water Treatment Plant
Project Number: OK13092
Drilling Method: Solid Stem Auger
Equipment Used: Giddings
Hammer Type: Automatic
Boring Location: West Hole

Project Location: Stillwater, Oklahoma
Date Drilled: 5/21/13
Weather Conditions:
Surface Elevation:
Drill Crew: Data Testing, Inc.
Logged By: Teja Maganti, E.I.T

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	N-Value / Qu (tsf) / Atterberg Limits / % Moisture	SOIL DESCRIPTION	GRAPHIC	REMARKS
			1	12-11-11		SILTY CLAYEY SAND (SC-SM): gray-brown, orange-brown and orange pockets, with sandstone fragments, trace to low plasticity, moist, dense		Sample #1: 0.5-2 ft. Atterberg Limits: LL=22, PL=16, PI=6 % fines = 36.3
						2.0		
			2	9-10-19		INETERLAYERED SANDSTONE AND LEAN CLAY: tan, yellow, grayish tan and some reddish brown, low plasticity, moist, poorly cemented		
5			3	17-28-27	>>	- reddish brown and some tan, medium plasticity		
						7.0		
						HIGHLY WEATHERED MUDSTONE: red and reddish brown, medium plasticity, moist, soft		
			4	10-19-28				
10								
						- reddish brown and grayish tan		
			5	37-50/3"	>>	14.3 - moderately hard		
15						Boring Terminated at 14.3 feet. Boring Backfilled on 5-20-13.		Groundwater seepage not encountered while drilling and boring dry upon completion

SAMPLE TYPE ⊠ Split Spoon

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION
▽	GROUNDWATER LEVEL IN THE BOREHOLE	**UD**	UNDISTURBED
Qu	UNCONFINED COMPRESSIVE STRENGTH ESTIMATE FROM POCKET PENETROMETER TEST		

LOG OF BORING 2 OK13092.GPJ BESI.GDT 5/30/13

BUILDING & EARTH SCIENCES, INC.

BORING LOG DESCRIPTION

Building & Earth Sciences, Inc. (Building & Earth) used the gINT software program to prepare the attached boring logs. The gINT program provides the flexibility to custom design the boring logs to include the pertinent information from the subsurface exploration and results of our laboratory analysis. The soil and laboratory information included on our logs is summarized below:

Depth
The depth below the ground surface is shown.

Sample Type
The method used to collect the sample is shown. The typical sampling methods include Split Spoon Sampling, Shelby Tube Sampling, Grab Samples, and Rock Core. A key is provided at the bottom of the log showing the graphic symbol for each sample type.

Sample Number
Each sample collected is numbered sequentially

Blows per 6", REC%, RQD%
When Standard Split Spoon sampling is used, the blows required to drive the sampler each 6-inch increment are recorded and shown in column 4. When rock core is obtained the recovery ration (REC%) and Rock Quality Designation (RQD%) is recorded.

Soil Data
Column 5 is a graphic representation of 4 different soil parameters. Each of the parameters use the same graph, however, the values of the graph subdivisions vary with each parameter. Each parameter presented on column 5 is summarized below:

- **N-Value**- The Standard Penetration Test N-Value, obtained by adding number of blows required to drive the sampler the final 12 inches, is recorded. The graph labels range from 0 to 50.
- **Qu** – Unconfined Compressive Strength estimate from the Pocket Penetrometer test in tons per square foot (tsf). The graph labels range from 0 to 5 tsf.
- **Atterberg Limits** – The Atterberg Limits are plotted with the plastic limit to the left, and liquid limit to the right, connected by a horizontal line. The difference in the plastic and liquid limits is referred to as the Plasticity Index. The Atterberg Limits test results are also included in the Notes column on the far right column of the boring log. The Atterberg Limits graph labels range from 0 to 100.
- **% Moisture** – The Natural Moisture Content of the soil sample as determined in our laboratory.

Soil Description
The soil description prepared in accordance with ASTM D 2488, Visual Description of Soil Samples. The Munsel Color chart is used to determine the soil color. Strata changes are indicated by a solid line, with the depth of the change indicated on the left side of the line. If subtle changes within a soil type occur, a broken line is used. The Boring Termination or Auger Refusal depth is shown as a solid line at the bottom of the boring.

Graphic
The graphic representation of the soil type is shown. The graphic used for each soil type is related to the Unified Soil Classification chart. A chart showing the graphic associated with each soil classification is included.

Remarks
Remarks regarding borehole observations, and additional information regarding the laboratory results and groundwater observations.

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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